

REMARKS

Reconsideration and allowance of the present patent application based on the following remarks are respectfully requested.

By this Response, no claims are amended, added or cancelled. Accordingly, after entry of this Response, claims 1-13 and 16-20 will remain pending in the patent application.

Claims 1, 4, 13 and 16 were rejected under 35 U.S.C. §102(b) based on Nishi *et al.* (U.S. Patent No. 5,991,009) (hereinafter "Nishi"). The rejection is respectfully traversed.

Claim 1 is patentable over the cited portions of Nishi because this claim recites a lithographic apparatus including an illumination system configured to condition a beam of radiation, the illumination system comprising a reflective integrator disposed along an optical axis of the lithographic apparatus, the reflective integrator having a rectangular cross-section perpendicular to said optical axis, the cross-section having sides parallel to mutually perpendicular X and Y axes; and an optical element, constructed and arranged to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes. The cited portions of Nishi do not disclose, teach or suggest these features.

The cited portions of Nishi disclose a lithographic apparatus including a light source 1 for producing illumination light, a light source image forming member 7 for forming a plurality of light source images with illumination light incident thereon, a condenser lens system 11 for condensing beams from the plurality of light source images to illuminate a mask, and a wavefront splitting member G disposed between the light source and the light source image forming member, for splitting a wavefront of the illumination light from the light source into a plurality of wavefronts. (*See, e.g.*, col. 4, lines 34-44 and FIG. 1 of Nishi).

However, unlike claim 1, the cited portions of Nishi are silent as to a reflective integrator disposed along an optical axis of the lithographic apparatus, the reflective integrator having a rectangular cross-section perpendicular to said optical axis. The Office Action refers to element 7 and FIG. 1 of Nishi as allegedly disclosing, teaching or suggesting a reflective integrator as recited in claim 1. However, those cited portions of Nishi merely disclose a fly-eye lens, which is different from a reflective integrator as will be appreciated by one of ordinary skill in the art. A fly-eye lens is a composite lens comprising an array or honeycomb of small lenses. Specifically, and as explained, for example, at col. 1, lines 35-40 of U.S. Patent No. 6,337,734 to Mori (cited in the Office Action), a fly-eye lens is a bundle of

rod lenses, the entrance and exit surfaces of which have their focal points on each other's surface. A group of light beams that impinge upon the rod lenses at an identical angle are condensed at the exit surfaces and form a number of points of condensed light on the exit surface of the fly-eye lens. (*See, e.g.*, col. 1, lines 35-40 of Mori and col. 4, lines 45-64 and FIG. 2 of Nishi). Thus, a fly-eye lens is merely adapted to create a plurality of source points by refraction. By contrast, a reflective integrator, as known in the art, is adapted to create a plurality of source points by reflection. (*See, e.g.*, paragraphs 48-49 and FIG. 2 of the present application). Accordingly, the fly-eye lens 7 is clearly not a reflective integrator as claimed. Therefore, for at least this reason, the rejection of claim 1 based on Nishi should be withdrawn.

Furthermore, unlike claim 1, the cited portions of Nishi fail to disclose, teach or suggest an optical element, constructed and arranged to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes. The Office Action refers to element 8 and col. 8, lines 16-17 and col. 10, lines 9-14 of Nishi as allegedly disclosing, teaching or suggesting such an optical element. However, those cited portions of Nishi merely disclose an aperture stop 8 having a circular aperture 8a. The aperture stop 8 of Nishi is clearly not configured to redistribute an intensity distribution exiting the reflective integrator, much less an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes. Rather, and as shown in FIG. 3b of Nishi, the aperture stop 8 is merely adapted to block parts of the light source images 22, 23, 24 that are created by the fly-eye lens 7. Specifically, and as shown in FIG. 3b of Nishi, the light source images located at the corners of the fly-eye lens 7 are removed by the aperture stop 8. As such, by virtue of removing part of the light source images, the aperture stop 8 of Nishi is clearly incapable of redistributing an intensity distribution exiting the reflective integrator, as required by claim 1. Furthermore, the aperture stop 8 clearly is not configured to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes. The cited portions of Nishi do not address, for example, such asymmetry at all. Accordingly, the rejection of claim 1 based on Nishi should be withdrawn.

Claim 4 is patentable over the cited portions of Nishi at least by virtue of its dependency from claim 1, and for the additional features recited therein.

Claim 13 is patentable over the cited portions of Nishi for at least similar reasons as provided above in connection with claim 1. Namely, claim 13 is patentable over the cited

portions of Nishi at least because this claim recites an illumination system including a reflective integrator disposed along an optical axis, the reflective integrator having a rectangular cross-section perpendicular to said optical axis, the cross-section having sides parallel to mutually perpendicular X and Y axes; and an optical element, constructed and arranged to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes.

Similarly, claim 16 is patentable over the cited portions of Nishi for at least similar reasons as provided above in connection with claim 1 and for the features recited therein. Namely, claim 16 is patentable over the cited portions of Nishi at least because this claim recites a lithographic apparatus comprising, *inter alia*, an illumination system configured to condition a beam of radiation, wherein the illumination system comprises a reflective integrator disposed along an optical axis of the lithographic apparatus, the reflective integrator having a rectangular cross-section perpendicular to said optical axis, the cross-section having sides parallel to mutually perpendicular X and Y axes, and an optical element, constructed and arranged to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes.

Accordingly, reconsideration and withdrawal of the rejection of claims 1, 4, 13 and 16 under 35 U.S.C. §102(b) based on Nishi are respectfully requested.

Claims 1-3 and 13 were rejected under 35 U.S.C. §103(a) based on Mori (U.S. Patent No. 6,337,734) in view of Bowron *et al.* (U.S. Patent No. 6,205,271) (hereinafter “Bowron”). The rejection is respectfully traversed.

Claim 1 recites a lithographic apparatus including an illumination system configured to condition a beam of radiation, the illumination system comprising a reflective integrator disposed along an optical axis of the lithographic apparatus, the reflective integrator having a rectangular cross-section perpendicular to said optical axis, the cross-section having sides parallel to mutually perpendicular X and Y axes; and an optical element, constructed and arranged to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes. The cited portions of Nishi do not disclose, teach or suggest at least these aspects.

As conceded at page 4 of the Office Action, Mori fails to disclose, teach or suggest a reflective integrator having a rectangular cross-section. However, Applicant respectfully submits that there are additional claimed aspects that are absent in the cited portions of Mori. For example, the cited portions of Mori fail to even disclose, teach or suggest a reflective

integrator. As discussed above, a fly-eye lens is clearly not a reflective integrator as claimed. Further, the cited portions of Mori fail to disclose, teach or suggest an optical element, constructed and arranged to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes.

The Office Action refers to the optical element in Mori located immediately after the optical unit 7 as allegedly disclosing, teaching or suggesting an optical element, constructed and arranged to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes. Respectfully, those cited portions of Mori merely relate to a mirror that redirects the intensity distribution selected/controlled by the diaphragm 6. The mirror in Mori located immediately after the optical unit 7 clearly is not configured to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes. The mirror shown in Mori is clearly incapable of providing such redistribution. Rather, that mirror of Mori merely preserves symmetries in the intensity distribution with respect to axes X and Y. In other words, the bundles of light rays coming out of the mirror in Mori maintain the same symmetry with respect to the X and/or Y axis as those bundles of light rays have coming into the mirror in Mori.

Further, the cited portions of Bowron fail to remedy the deficiencies of Mori. The cited portions of Bowron merely disclose an optical integrator rod but are silent as to an optical element, constructed and arranged to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes. Thus, any proper combination of Mori and Bowron cannot result, in any way, in the invention of claim 1.

The Office Action states that "it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the optical integrator of Mori by having a rectangular cross-section for at least the purpose of reducing the amount of reflections." This alleged motivation for combining the teachings of Mori and Bowron clearly lacks merit. As explained previously, a reflective integrator, such as the one shown in Bowron, is configured to internally reflect light from an illumination source to create a plurality of light source images. By contrast, a fly-eye lens, such as the one disclosed by Mori, creates a plurality of source points by refraction (as opposed to reflection). Thus, if one wanted to reduce the amount of reflection, as suggested in the Office Action, one would clearly not use a reflective integrator, such as the one disclosed in Bowron, which obviously would only

increase the amount of reflections compared to a fly-eye lens. Clearly, a proper motivation for combining the teachings of Mori and Bowron has not been established. In addition, the alleged motivation, "for at least the purpose of reducing the amount of reflections", does not appear to have any relevance either to the claims or to the combination of Mori and Bowron and no evidence in any of the references is provided to support this conclusion. Thus, for at least this reason, the rejection of claim 1 based on Mori, Bowron and any proper combination thereof should be withdrawn.

Claims 2-3 are patentable over Mori, Bowron and any proper combination thereof at least by virtue of their dependency from claim 1, and for the additional features recited therein.

Claim 13 is patentable over Mori, Bowron and any proper combination thereof for at least similar reasons as provided above for claim 1 and for the features recited therein. Namely, claim 13 is patentable over Mori, Bowron and any proper combination thereof at least because this claim recites an illumination system including, *inter alia*, an optical element, constructed and arranged to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes.

Accordingly, reconsideration and withdrawal of the rejection of claims 1-3 and 13 under 35 U.S.C. §103(a) based on Mori in view of Bowron are respectfully requested.

Claims 2-3, 5-12 and 17-20 were rejected under 35 U.S.C. §103(a) based on Nishi in view of Willson *et al.* (U.S. Patent No. 6,102,554) (hereinafter "Willson"). The rejection is respectfully traversed.

Claims 2-3 and 5-12 are patentable over Nishi at least by virtue of their dependency from claim 1, and for the additional features recited therein. Namely, claims 2-3 and 5-12 are patentable over Nishi at least because these claims recite a lithographic apparatus including an illumination system configured to condition a beam of radiation, the illumination system comprising a reflective integrator disposed along an optical axis of the lithographic apparatus, the reflective integrator having a rectangular cross-section perpendicular to said optical axis, the cross-section having sides parallel to mutually perpendicular X and Y axes; and an optical element, constructed and arranged to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes.

The cited portions of Willson fail to remedy the deficiencies of Nishi, as explained in Applicant's previously filed Responses. The cited portions of Willson merely disclose an

apparatus for modifying a light beam. Thus, any proper combination of Nishi and Willson cannot result, in any way, in the invention of claims 2-3 and 5-12.

Similarly, claims 17-20 are patentable over Nishi at least by virtue of their dependency from claim 13, and for the additional features recited therein. Namely, claims 17-20 are patentable over Nishi at least because these claims recite an illumination system including a reflective integrator disposed along an optical axis, the reflective integrator having a rectangular cross-section perpendicular to said optical axis, the cross-section having sides parallel to mutually perpendicular X and Y axes; and an optical element, constructed and arranged to redistribute an intensity distribution exiting the reflective integrator such that the intensity distribution is asymmetric with respect to at least one of the X and Y axes.

As mentioned previously, the cited portions of Willson fail to disclose, teach or suggest these aspects. Therefore, any proper combination of Nishi and Willson cannot result, in any way, in the invention of claims 17-20.

Accordingly, reconsideration and withdrawal of the rejection of claims 2-3, 5-12 and 17-20 under 35 U.S.C. §103(a) based on Nishi in view of Willson are respectfully requested.

In view of the foregoing, the claims are now in form for allowance, and such action is hereby solicited. If any point remains in issue which the Examiner feels may be best resolved through a personal or telephone interview, please contact the undersigned at the telephone number listed below.

Please charge any fees associated with the submission of this paper to Deposit Account Number 033975 under our order no. 081468/0309024. The Commissioner for Patents is also authorized to credit any over payments to the above-referenced Deposit Account.

Respectfully submitted,

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